ACC NR: AM5027749

Card 5/10

ACC NR: AM5027749

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ACC NR: AM5027749

CHERNYY, F.G., inzh.; GOL'DGUBER, I.S., inzh.

Installation of heat control and automatic control equipment. Energ. stroi. no.1:37-41 '65. (MIRA 18:7)

CHERNYY, F.I.

Situation in the port of Krasnovodsk in connection with the lowering level of the Caspian Sea. Trudy Okean. kom. 5:288-289 '59.
(MIRA 13:6)

(Krasnovodsk--Harbor)

1. VALASIK, G.A. KOTOVA, P.V. CHERNYY, F.O.

2. USSR (600)

3. Horse Breeding

4. More about breeding horses for milk production.
Konevodstvo No. 11 - 1952.
21

9. Monthly List of Russian Acessions, Library of Congress, February, 1953. Unclassified.

CHERNYI, F.O. [Chernii, F.O.], kand.med.nauk

Regimen for sufferers of jaundice. Nauka i zhyttia 9 no.1: 36-37 Ja '59. (MIRA 12:1)

(Jaundice)

CHERNYY, F.O.[Cherniy, F.O.], kand.med.nauk

Cholecystitis. Nauka i zhyttia 10 no. 10:42-44 O '60. (MIRA 14:4)

(GALL BLADDER—DISEASES)

KAMENETSKIY, Vladimir Teofilovich; CHERNYY, F.O., red.; NARINSKAYA, A.L., tekhn. red.

[Treatment of peptic ulcers of the stomach and duodenum at Ukrainian health resorts] Lechenie bol'nykh iazvennoi bolezn'iu zheludka i dvenadtsatiperstnoi kishki na kurortakh Ukrainy. Kiev, Gosmedizdat USSR, 1962. 49 p. (MIRA 16:6)

(PEPTIC ULCER)
(UKRAINE--HEALTH RESORTS, WATERING PLACES, ETC.)

CHERNYY, F.O., kand.med.nauk (Kiyev)

Nutrition of elderly people. Zdrav.Turk. 7 no.2:29-33 F '63.
(MIRA 16:4)

(AGED--NUTRITION)

CHERNYY, G.A., kandidat ekonomicheskikh. nauk.

Calculating the cost of production on collective farms. Nauka i pered. op. v sel'khoz. 6 no.11:58-60 N '56. (MLRA 10:1)
(Collective farms--Accounting)

CHERNYY, G.A., kandidat ekonomicheskikh nauk.

Economic estimation of losses due to the inundation of croplands. Gidr. i mel. 8 no.6:12-18 Je '56. (MLRA 9:9)

(Hydraulic engineering) (Agriculture--Economic aspects)

30(1) SOV/99-59-10-2/11

AUTHOR: Chernyy, G.A., Candidate of Economic Sciences

TITLE: The Economic Justification and Estimation of the Effectiveness of Capital Investments in Melioration Engineering

PERIODICAL: Gidrotekhnika i melioratsiya, 1959, Nr 10, pp 17-27 (USSR)

ABSTRACT: The All-Union Scientific and Technical Conference on Problems of Determining the Economic Effectiveness of Capital Investments and New Equipment in the National Economy of the USSR, held in June 1958, passed a resolution calling for the drafting of a standard method of estimating the economic effectiveness of capital investments in melioration engineering. The present article is one in a series of discussions on the subject. The author compares melioration and reclamation work with other factors which could also lead to a rise in agricultural production and states that the basic criterion and indication of the effectiveness

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SOV/99-59-10-2/11

The Economic Justification and Estimation of the Effectiveness of Capital Investments in Melioration Engineering

of capital investments is the cost of production. He criticizes planning organizations and individual economists for determining the effectiveness of investments for melioration engineering on a purely local basis, i.e. the effects which the drainage, reclamation, leveling work, etc, will bring in terms of increased agricultural production or lowered prices of produce within the actual area where the work is to be performed. The author believes that this effectiveness should be calculated on a national basis and suggests as the basic criterion for estimation, the turn-over tax collected from the actual prices of agricultural produce. By considering this for small areas and comparing it against the volume of capital investments made for melioration works, the actual effectiveness of the investments may be judged.

Card 2/2

1. CHERNYY, G.G.

2. USSR (600)

4. Hydrodynamics

7. "Irregular movement of real liquid in tubes." I.A.Charnyy. Reviewed by G.G. Chernyy. Sov.kniga No. 1 1953.

9. Monthly List of Russian Accessions, Library of Congress, April 1953, Uncl.

~~USSR/Physics - Hydrodynamics, Shock Wave~~ CHERNYY, G. G. Mar 53

CHERNYY, G. G.

"Influence of Viscosity and Thermal Conduction on the Flow of Gas Behind a Strongly Warped Shock Wave," L. I. Sedov, M. P. Mikhaylova, and G. G. Chernyy, Chair of Hydromechanics, Moscow U

Vest Mos Univ, Ser Fizikomat i Yest Nauk, No 2, pp 95-100

State that during circulation of supersonic flow of gas around small-sized bodies with the formation of the main shock wave, one can expect that the considerable velocity and temp gradients behind it, arising in consequence of the great curvature of the shock wave, now require that greater attention be paid to the influence, mainly on discontinuities (jumps), of those terms in the relations that depend on the gas viscosity and heat conductivity. Attempts to evaluate such influence in the case of symmetrical circulation of the supersonic flow of gas around a body of revolution or profile with the fomation of the main shock wave ahead of the body.

257T90

CHERNYY, G.C.

SEDOV, LEONID IVANOVICH, M. P. MIKHAILOVA, and G. G. CHERNYY.

O vliianii viazkosti i teploprovodnosti na techenie gaza za sil'no iskrivlennoi udarnoi volnoi. (Moscow. Universitet. Vestnik, 1953, no. 3, p. 95-100, diagrs.)

Title tr.: Effect of viscosity and heat conductivity on gas flow behind a sharply curved impact wave.

SO: Aronautical Sciences and Aviation in the Soviet Union, Library of Congress, 1955

CHERNYY, G. G.

1-F/W

Černyi, G. G. Laminar motion of gas and liquid in a boundary layer with a surface of discontinuity. Izv. Akad. Nauk SSSR. Otd. Tehn. Nauk 1954, no. 12, 38-67 (1955). (Russian)

In many cases where gas or vapour flows along a solid surface there is formed a layer with a well-defined boundary across which there is a jump in the state of the medium as when, for example, a jet of steam is separated by a film of water from a cooling surface over which the steam flows, or an injection of liquid is employed to protect a wall from the flow of a hot gas. Such problems can be treated by the mathematical methods of boundary-layer theory. The author sets up the equations of laminar flow taking into account viscosity and heat conduction and applies them to (1) streaming over a semi-infinite porous plate, (2) steam moving over a plane on which it condenses.

L. M. Milne-Thomson (Greenwich).

HOWARTH, L.; BUNIMOVICH, A.I. [translator]; VISHNEVETSKIY, S.L. [translator]; YELISEYEV, Yu.B., [translator]; CHERNYY, G.G., redaktor; IOVLEVA, N.A., tekhnicheskiy redaktor.

[Modern developments in fluid dynamics; high speed flow. Translated from the English] Sovremennoe sostoianie aerodinamiki bol'shikh skorostei. Perevod s angliiskogo A.I.Bunimovicha, S.L.Vishnevetskogo i IU.B.Eliseeva. Pod red. G.G.Chernogo. Moskva, Izd-vo inostrannoi lit-ry. Vol.1 1955. 491 p. (MLRA 9:5)

(Fluid dynamics)

CHERNYY, G. G.

USSR/ Physics

Card 1/1 Pub. 22 - 7/49

Authors : Chernyy, G. G.

Title : A boundary layer with a surface of separation. The flow around a plate with the bleeding of a fluid through its surface

Periodical : Dok. AN SSSR 100/5, 867-870, Feb 11, 1955

Abstract : The relationships between the parameters of a flow of gas or liquid over a surface of separation when the surface is inside of a boundary layer are discussed. A sample solution of a problem dealing with a boundary layer in which there is no bleeding of flowing matter through a surface of separation is given. Also the flow around a plate of a gas or liquid when the gas or liquid goes through the plate surface is analyzed. Three references: 2 USSR and 1 German (1943-1949)

Institution : .....

Presented by : Academician L. I. Sedov, November 27, 1954

CHERNYY, G.G.

USSR/ Physics - Hydromechanics

Card 1/1 Pub. 22 - 10/51

Authors : Chernyy, G. G.

Title : Condensation of a moving vapor on a plane surface

Periodical : Dok. AN SSSR 101/1, 39-42, Mar 1, 1955

Abstract : A solution is presented for the problem of a gas flow in a boundary layer with a surface separation oriented within the boundary layer. The flow of the mass through the surface of separation was fixed as different from zero. The condensation of a moving vapor on a plane surface was used as an example. Two USSR references (1952 and 1955). Graph.

Institution : ....

Presented by : Academician L. I. Sedov, November 27, 1954

CHERNYY, G.G.

Černyĭ, G. G. One-dimensional unsteady motion of a perfect gas with strong shock waves. [illegible] SSSR (N.S.) 107 [illegible]

[illegible] the preceding [illegible] flow [illegible] symmetrical shocks [illegible] shock [illegible] the [illegible] satisfy [illegible] to terms of order ε and the shock conditions [illegible] fied by retaining only the highest order terms [illegible] An approximate [illegible] described for flows produced by a [illegible] when the [illegible] where [illegible] is a constant. Approximate [illegible] well with numerical results obtained for an exact theory [illegible]

124-11-12511

CHERNYY, G. G.

Translation from: Referativnyy Zhurnal, Mekhanika, 1957, Nr 11, p 28 (USSR)

AUTHOR: Chernyy, G.G.

TITLE: The Adiabatic Flow of a Perfect Gas with Intense Shock Waves. (Adiabaticheskiye dvizheniya sovershennogo gaza s udarnymi volnami bol'shoy intensivnosti)

PERIODICAL: Tr. 3-go Vses. matem.s"yezda, Vol I., Moscow, A. N. SSSR, 1956, pp 215-216.

ABSTRACT: It is assumed that in a gas jet the density is appreciably higher than in the surrounding regions of the flow. The density ρ inside the jet can be conveniently expressed by a new term $\rho = \rho'/\varepsilon$, where the small quantity ε is such that ρ remains of the same order of magnitude as the density outside the jet. Having replaced ρ with the quantity ρ'/ε in the flow equations, the A. seeks a solution to the equations by means of an expansion in series arranged according to powers of ε. This method is fundamentally analogous to von Mises' method of obtaining an equation for the theory of the boundary layer from the equation of motion of a viscous fluid by means of an expansion in series according to powers of 1/R, where R is the Reynolds Number

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...the flow of

HOWARTH, L., editor; BUNIMOVICH, A.I.[translator]; VISHNEVETSKIY, S.L. [translator]; YELISEYEVA, Yu.B. [translator]; CHERNYY, G.G., redaktor; BOGDANOV, V.P., tekhnicheskiy redaktor

[Modern developments in fluid dynamics; high speed flow. Translated from the English] Sovremennoe sostoianie aerodinamiki bol'shikh skorostei. Perevod s angliiskogo A.I.Bunimovicha, S.L.Vishnevetskogo i IU,B.Eliseeva. Pod red. G.G.Chernogo. Moskva, Izd-vo inostrannoi lit-ry. Vol.2. 1956. 382 p. (MLRA 9:7)
(Fluid dynamics)

CHERNYY, G. G.

"Adiabatic Motion of Perdect Gas with High-Intensity Shock Waves," Lomonsov Lectures in 1956," Vest. Mosk. U., Physico Math and Natural Sciences Series, 4, No. 6, pp 147-160, Mechanicomathematics Faculty

Translation U-3,054,363

CHERNYY, G.G. (Moskva)

Twisted flow of compressed gases in ducts. Izv. AN SSSR. Otd. tekh. nauk no.6:55-62 Je '56. (MLRA 9:9)

(Gas flow)

Černyĭ, G. G. Gas flow past bodies at high supersonic speed. Dokl. Akad. [illegible] 221-224. (Russian)

Let L be the boundary of a plane cross section of a body in a steady plane or [illegible] [illegible] along L [illegible]

In terms of [illegible] and expresses [illegible] in the form $y = y_0$ [illegible] conditions at L [illegible] the terms of order [illegible] circular cylinder [illegible] concave [illegible]

CHERNYY, G.G.

"The Adiabatic Motions of an Ideal Gas With Shock Waves of High Intensity," by G. G. Chernyy, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, No 3, Mar 57, pp 66-81

This article deals with an approximate method of calculating irregular one-dimensional flows of a gas with shock waves of high and moderate intensity, which is based on the determination of the equations of motion in the form of series according to powers of $\varepsilon = (\gamma - 1)/(\gamma + 1)$, where γ = the ratic of specific heat.

The method was explained by the author in earlier articles (Doklady Akademii Nauk SSSR, Volume 107, No 2 and No 5, 1956) on the calculation of certain regular and irregular motions of a gas with shock waves of extremely high intensity. (U)

Sum in 1467

CHERNYY, G G

AUTHOR: Chernyy, G. G. (Moscow). 24-6-12/24

TITLE: The flow of an ideal gas around bodies at large supersonic speed. (Obtekaniye tel ideal'nym gazom pri bol'shoy sverkhzvukovoy skorosti).

PERIODICAL: "Izvestiya Akademii Nauk, Otdeleniye Tekhnicheskikh Nauk" (Bulletin of the Ac.Sc., Technical Sciences Section), 1957, No.6, pp.77-85 (U.S.S.R.)

ABSTRACT: By establishing the asymptotic behaviour of the aerodynamic properties of bodies surrounded by flow tending to an infinite Mach number, the theory of high speed aerodynamics facilitates the analysis of such properties at moderate supersonic speeds. A simplification of gas motion equations at high Mach numbers has led to laws of similarity in the flow of an ideal gas around bodies at very high speeds. Reference is made to Oswatitsch (Aehnlichkeitsgesetze fuer Hyperschallstroemung, Z.f.Ang. Math.u.Phys. 1951) who showed that the flow about a body of arbitrary shape tends to a limiting condition, the sooner the blunter the nose of the body. This limiting condition is known as hypersonic flow, which is reached when the product of the Mach number and the cosine of the angle between the undisturbed flow and the

Card 1/3

24-6-12/24

The flow of an ideal gas around bodies at large supersonic speed. (Cont.)

normal to the surface of the body in its nose portion greatly exceeds unity. The basic relations resemble those at subsonic speeds because the flow pattern ceases to be dependent on the magnitude of the speed. On the other hand, hypersonic flows at a small angle of attack have been successfully treated by a linearised theory. The non-linear treatment has led to exact solutions only for the flow around a wedge or a circular cone. In the general case, only the numerical method of characteristics with assumptions difficult to verify have been useful. In the present work an analytical method for finding the flow around axially symmetrical bodies and plane profiles in an ideal gas at high supersonic speeds is presented, which is based on the expansion of the solutions of the equations of gas dynamics into series of special type in terms of powers of $\varepsilon = (\gamma-1)/(\gamma + 1)$ (where γ is the ratio of specific heats). In its conception the method is similar to an expansion into series in terms of powers of the Reynolds number customary in the theory of the boundary layer. The method has previously been used by the author (Flow of gas around bodies at high supersonic speed, Dokl. Ak.

Card 2/3

CHERNYY, G.G.

AUTHORS: Gonor, A.L. and Chernyy, G.G. (Moscow). 24-7-11/28

TITLE: On the bodies with a minimum resistance at high supersonic speeds. (O telakh naimen'shego soprotivleniya pri bol'shikh sverkhzvukovykh skorostyakh).

PERIODICAL: "Izvestiya Akademii Nauk, Otdeleniye Tekhnicheskikh Nauk" (Bulletin of the Ac.Sc., Technical Sciences Section), 1957, No.7, pp.89-93 (U.S.S.R.)

ABSTRACT: In an earlier paper by one of the authors (1) it was established that, in the case of movement with a high supersonic speed, the pressure p at the surface of axis-symmetrical bodies or on the plane contours of such bodies can be expressed by eq.(1), p.89 if the turns of the order $(\gamma-1)/(\gamma+1)$ are disregarded (γ - heat capacity ratio). The resistance coefficient of bodies of optimum shape is determined by eq.(4), p.91. The following two limit cases are considered: the angles between the tangent to the contour and the direction of the incident flow are small everywhere, i.e. $p \ll 1$ and the case in which $p_0 = \infty$. The shape of the generatrix of the solid of revolution with minimum external resistance is determined by eq.(5), p.91, which is equivalent to the relation determined a long time

1/2

On the bodies with a minimum resistance at high supersonic speeds. (Cont.)

ago by Newton. 24-7-11/28

2/2 There are two figures, two tables and three references, two of which are Slavic.

SUBMITTED: September 18, 1956.

AVAILABLE:

AUTHOR CHERNYY, G.G., (Moscow), PA - 3074

TITLE Adiabatic Movements of an Ideal Gas with Striking Waves of High Intensity. One dimensional Nonsteady Movement. (Adiabaticheskiye dvisheriya sovershennogo gaza s udarnymi volnami bol'shoy intensivnosti. Odnomernyye neustanovivshiyesya dvizheniya - Russian)

PERIODICAL Izvestiia Akad. Nauk SSSR, Otdel. Tekhn., 1957, Vol 21, Nr 3, pp 66-81, (U.S.S.R.)
Received 6/1957 Reviewed 7/1957

ABSTRACT First the equations of motion and their solutions are treated. The principal functions sought are R - the distance of the particles from the center of symmetry, the density ϱ and the pressure p. It is taken that the gas density is substantially higher behind the striking(shock)waves than before them. For the density behind the striking waves ϱ' is stablished. Then $\varrho = \frac{\varrho'}{\varepsilon}$ whereby ε has such a value that ϱ' is of the same order of magnitude as the density before the strieking wave. The solution of the equations for continuity, motion and energy is resolved in the form of series to the power of ε. One takes it that the function $R_o(t)$ (an arbitrary function) constitutes the law of expansion for the striking wave. The equations are deduced in which the sought for magnitudes are expressed by the function $R_o'(t)$. For ε the ratio $(\gamma-1)/(\gamma+1)$ is inserted where γ is the ratio of the specific heats. In the second chapter the problem of the piston is treated. It is shown that when, in the analysis in series, one is satisfied with the first two terms, it is possible to obtain good agreement between the approximated

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Adiabatic Movements of an Ideal Gas with Striking Waves of High Intensity. One Dimensional Nonsteady Movement. PA - 3074

calculations and the exact even when $\gamma = 1.4$ for those problems where the basic assumptions are fulfilled. In the third chapter the question of the explosion in a point is handled. An exact analytic equation is here possible and the method laid down inthe first chapter is employed. The problem of the explosion in a point leads finally tothe discovery of the function $\varphi(x)$ which is contained in the integral-differentialequation $\varphi = R^a$. $x = R^\nu / N$ which is obtained according to the above mentioned method. In this equation ν equals 1,2,3 corresponding to the flow with flat, cylindrical and sperical waves.
(With 13 illustrations and 7 Slavic references).

ASSOCIATION
PRESENTED BY
SUBMITTED 10.2.1956.
AVAILABLE Library of Congress.
Card 2/2

AUTHOR: CHERNYY, G.G. PA - 2091

TITLE: The Problem of the Punctiform Explosion. (Zadacha o tochechnom vzryve, Russian).

PERIODICAL: Doklady Akademii Nauk SSSR, 1957, Vol 112, Nr 2, pp 213-216 (U.S.S.R.)

Received: 3 / 1957 Reviewed: 4 / 1957

ABSTRACT: Let it be assumed that at a certain point of a resting homogeneous gas a momentaneous emission of the energy E_0, i.e. an explosion, takes place. The powerful shock wave produced on the occasion of the explosion becomes weaker with increasing distance from the center of the explosion. The attempt is now made to determine the motion of the gas behind the shock wave. (In a similar manner the problem for flows with plane and cylindrical waves is formulated). As long as the initial pressure in the gas as compared with pressure behind the front of the shock wave can be looked upon as negligibly low, the motion is automodellike (strong explosion). The corresponding problem has a rigorously analytical solution. In the case of the shock wave becoming weaker neglect of initial pressure (counter pressure) is no longer permitted.

The present work solves the problem of punctiform explosions by the development of the solution in series according to

Card 1/3

The Problem of the Punctiform Explosion. PA - 2091

powers of $\varepsilon = ((\gamma - 1)/(\gamma + 1))$, where γ denotes the ratio of thermal capacities. The equation for the one-dimensional motion of a gas is set up in the following manner:
$\partial R/\partial m = 1/(\varrho R^{\nu-1})$, $\partial^2 R/\partial t^2 = -R^{\nu-1}\partial p/\partial m$, $(\partial/\partial t)(p/\varrho^{\gamma}) = 0$.
Here R denotes the distance of the particle from the center (axis, plane) of symmetry, p - pressure, and ϱ - density. Independent variables are: the time t and the LAGRANGIAN variable $m = \varrho_1^0 r^{\nu}/\nu$. Here r denotes the initial distance of the particle from the symmetry center, ϱ_1^0 - the initial density of the gas, and it applies that $\nu = 1,2$, and 3 for flows with plane, cylindrical, and spherical waves respectively. Next, expressions for the parameters of the flow behind the shock wave are explicitly given. The solution of the system of equations written down first is set up as follows:
$R = R_0 + \varepsilon R_1 + \dots$, $p = p_0 + \varepsilon p_1 + \dots$, $\varrho = (\varrho_0/\varepsilon) + \varrho_1 + \dots$.
The expressions for p_0, ϱ_0, R_1, p_1 and ϱ_1 resulting by using the boundary conditions are explicitly written down. In the approximation studied here these formulae furnish a solution of the CAUCHY problem for the equations of the homogeneous

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The Problem of the Punctiform Explosion. PA - 2091

not steady motion of a gas if the initial data on the shock wave are known.
In the approximation investigated here the problem of a punctiform explosion is reduced to the determination of a function $\varphi(x)$, which depends on a variable x, from an integrodifferential equation (mentioned here). In the present instance only the initial period of the motion is investigated. (3 illustrations).

ASSOCIATION: Not given
PRESENTED BY: Academician L.I.SEDOV
SUBMITTED: 23.7.1956
AVAILABLE: Library of Congress

Card 3/3

AUTHOR: Chernyy, G. G. 20-114-4-12/63

TITLE: Supersonic Flow Past an Aerofoil With a Slightly Blunted Leading Edge (Vliyaniye malogo zatupleniya peredney kromki profilya na yego obtekaniye pri bol'shoy sverkhzvukovoy skorosti)

PERIODICAL: Doklady Akademii Nauk SSSR, 1957, Vol. 114, Nr 4, pp. 721-724 (USSR)

ABSTRACT: If the flow is investigated in a region that is large as compared to the characteristic extent of bluntness, the existence of the bluntness itself may be neglected, i.e. in that case a flow past a pointed body is concerned and the action of the bluntness upon the flow can be replaced by a force acting in a concentrated manner upon the leading point of the body. The author here confines himself to the flow past a symmetrical profile and he investigates the flow only in the upper half of the plane. The following applies to the non-steady motion of a thin body blunted in front: First the energy E is liberated on the plane (E is relative to the unit area) and the impulse I is transfered to the gas above it in a normal line. At the same moment the surface starts to move within the region occupied by the gas with the velocity U. If E = 0, I = 0 and U = const, the

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Supersonic Flow Past an Aerofoil With a Slightly Blunted Leading Edge 20-114-4-12/63

developing motion is automodel-like and the problem has a simple and accurate solution. But if E ≠ 0, I = 0, U = 0 or E = 0, I = 0, U = Ct^n, and if the developing shock wave is very intensive, the motion is also automodel-like and accurate solutions are known for the corresponding problems. In the latter case the motion is automodel-like also in the case of E ≠ 0, provided that n=-1/3. If n = -1/3, this is not the case and an accurate solution can only be brought about by methods of approximation. The method employed by the author in the solution of the equivalent problem of the unidimensional motion is based on the following: If there are strong shock waves, the bulk of gas in the disturbed region is concentrated in a thin layer behind the shock wave. The author here confines himself to the case U = const which corresponds to the flow round a wedge. The calculations are followed step by step. A blunting of the leading edge substantially changes the diagram of flow and distribution of pressure. This change is more marked in the case of thin wedges than of thick ones. There are 1 figure and 9 references, 5 of which are Slavic.

Card 2/3

Supersonic Flow Past an Aerofoil With a Slightly Bluhted Leading Edge 20-114-4-12/63

PRESENTED: December 27, 1956 by L. I. Sedov, Member of the Academy

SUBMITTED: December 24, 1956

Card 3/3

. CHERNYY, G.G.

AUTHOR: Chernyy, G. G. 20-4-13/60

TITLE: The Flow Around a Thin Truncated Cone at High Supersonic Velocities(Obtekaniye tonkogo zatuplennogo konusa pri bol'shoy sverkhzvukovoy skorosti)

PERIODICAL: Doklady Akademii Nauk SSSR, 1957, Vol. 115, Nr 4, pp.681-683 (USSR)

ABSTRACT: In an earlier paper (G.G.Chernyy,Dokl.Akad.nauk,1957,Vol 115, Nr 4) the author formulated the general problem of the flow around thin bodies of rotation that are blunted in front or around similar profiles by a gas flow at high supersonic velocities. He obtained an approximate solution for the flow around a blunted wedge. The present paper in the same approximate yields the solution of the problem of the flow around a truncated cone and then compares the solution found with the experimental data. The author examines here the symmetric flow around a thin truncated cone with the half angle α by a gas flow with the velocity V. The author replaces the action of the truncated part of the cone onto the gas by the action of the concentrated force X of the resistance drag of the truncated piece. The problem mentioned in the title is replaced by the equivalent problem of the unidimensional motion of gas, that did not become stationary, with cylindrical waves. In the initial moment the energy E is separated on

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CHERNYY, G. G.

16(1)

AUTHORS: Skoryy, I.A., University Lecturer, and Kopytov, V.D., Scientific Assistant SOV/55-58-2-33/35

TITLE: Lomonosov - Lectures 1957 at the Mechanical-Mathematical Faculty of Moscow State University (Lomonosovskiye chteniya 1957 goda na mekhaniko-matematicheskom fakul'tete MGU)

PERIODICAL: Vestnik Moskovskogo Universiteta, Seriya matematiki, mekhaniki, astronomii, fiziki, khimii, 1958, Nr 2, pp 241-246 (USSR)

ABSTRACT: The Lomonosov lectures 1957 took place from October 17 - October 31, 1957 and were dedicated the 40-th anniversary of the October revolution.
In the general meeting A.N. Kolmogorov, Academician spoke "On Approximative Representation of Functions of Several Variables by Superposition of Functions With Less Variables and ε-Entropy of Classes of Function". The lecture generalizes the results of Kolmogorov, A.G. Vitushkin, V.I. Arnol'd and V.M. Tikhomirov. The contents has been already published (Doklady Akademii nauk SSSR,114,5). Professor Kh.A.Rakhmatulin, Member of the Academy of Sciences of the Uz SSR, spoke on "Investigation of the Boundary Layer of the Motion of a two-Component Liquid".
The other lectures were given separately in the sections mechanics and mathematics. The following lectures were given.

1. Professor L.N. Sretenskiy, Corresponding Member, AS USSR : Propagation of Sound Waves From a Rotating Deformed Ball.
2. Professor G.G. Chernyy. The Flow Around Thin Truncated Bodies by Gas With High Supersonic Velocity.
3. Professor S.S. Nikiforov : Properties of the Calculation, Construction and Structure of Hydrotechnical Dikes on the Rivers of the Central Strip of the USSR.
4. Professor A.Ya. Sagomonyan : Penetration of a Rigid Body into the Ground.
5. M.Z. Litvinov-Sedoy, Senior Scientific Assistant : On the Synthesis of Control Circuits With Bounded Interval of Variation of the Controlled Variable.
6. V.A. Lomakin, Candidate of Physical-Mathematical Sciences : Scalar Plastic Metal Properties Under Variations of Structure.
7. Professor N.A. Slezkin : On Some Questions of the Flow Around Porous Walls.

Card 2/5

AUTHOR: Chernyy, G.G. (Moscow) SOV/24-58-4-8/39

TITLE: The Flow Round a Body at a High Supersonic Velocity When the Leading Edge is Slightly Blunted (Vliyaniye malogo zatupleniya perednego kontsa tela na yego obtekaniye potokom s bol'shoy sverkhzvukovoy skorost'yu)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1958, Nr 4, pp 54 - 66 (USSR)

ABSTRACT: An attempt is made to extend the theory of flow at high velocities round thin bodies whose leading edges are sharp (Refs 1, 2) to the case when the leading edge is slightly blunted. Only the case of symmetric flow over profiles or bodies of revolution are discussed. In formulating the problem it is assumed that all the elements of the surface which face in the direction of the flow form small angles with the direction of the flow and the dimensions of the blunt part are so small that it can be ignored when discussing the flow in regions with dimensions of the order of the longitudinal dimension of the body. The action of the blunt part of the body is replaced by the action of concentrated forces applied to the gas from the blunt part. On dimensional grounds expressions for the

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The Flow Round a Body at a High Supersonic Velocity When the Leading Edge is Slightly Blunted

pressure distribution on the surface of a flat plate and the density discontinuity are obtained. These expressions are analysed in the light of experimental evidence at a variety of high Mach numbers. The results show that it is possible to use the law of plane sections in the study of flow at high velocities over thin bodies with blunt leading edges. A further series of comparisons show that the effect of viscosity on the drag coefficient of the bluntness can be neglected if the Reynolds number is about 2000-6000. Furthermore, as γ is reduced, the effect of the bluntness diminishes. There is a short discussion of the case of a circular cylinder. At very high supersonic velocities the extent of the area of higher pressure increases proportionally to M^2 (in the absence of the Reynolds number effects on the drag coefficient of the bluntness); as γ decreases so does the extent of that area. Flow round a thin wedge is next discussed. It is shown that due to bluntness there is a significant increase in the drag coefficient. In addition, there is a forward movement of

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the centre of pressure. Finally, flow round a thin cone is considered. After deriving general expressions which take account of the initial gas pressure, results are derived ignoring it and they show that the pressure coefficient at the apex of the cone is infinite, but falls rapidly along the generators away from the apex, taking in one region a value lower than that for the sharp cone. When the drag coefficient reaches its minimum, the relative decrease in comparison with the sharp cone is 10%. There are 14 figures and 23 references, 8 of which are Soviet and 15 English.

SUBMITTED: December 26, 1957

APPROVED FOR RELEASE: 06/19/2000 CIA-RDP86-00513R000308710009-3"

PHASE I BOOK EXPLOITATION SOV/3643

Chernyy, Gorimir Gorimirovich

Techeniya gaza s bol'shoy sverkhzvukovoy skorost'yu (Hypersonic Gas Flow) Moscow, Fizmatgiz, 1959. 220 p. 7,500 copies printed.

Ed.: S.N. Shustov; Tech. Ed.: S.S. Gavrilov.

PURPOSE: The book is written for engineers, technicians, and scientists engaged in the study of hypersonic aerodynamics.

COVERAGE: The book covers the subject of hypersonic flow theory. Fundamental concepts and theoretical equations concerning hypersonic flow are outlined. Empirical results and design information are not included. Boundary-layer interaction phenomena and flow around sharp-nosed and blunted bodies are discussed. Adaptation of Newtonian theories and application of Busemann's formula are the subject of Chapter III. Shock-expansion theory is analyzed in Chapter IV, and simple approximate hypersonic flow solutions for sharp profiles, including an approximate deter-

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mination of the shock shape are presented.

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KVASHNINA, S.S. (Moskva); CHERNYY, G.G. (Moskva)

Steady streamlining of a cone by a flow of detonating gas. Prikl.mat. i mekh. 23 no.1:182-186 Ja-F '59. (MIRA 12:2)

(Aerodynamics)

CHERNYY, G. G., BAM-ZELIKOVICH, G. M., NEKRASOV, I. P. (Moscow)

"Boundary Layer Separation at Supersonic Speeds."

report presented at the First All-Union Congress on Theoretical and Applied Mechanics, Moscow, 27 Jan - 3 Feb 1960.

CHERNYY, G. G. (Moscow)

"Application of Integral Relations to Problems Concerning the Propagation of Strong Shock Waves."

report presented at the First All-Union Congress on Theoretical and Applied Mechanics, Moscow, 27 Jan - 3 Feb 1960.

CHERNYY, G. G. (Moscow U., Moscow)

"The use of Integral Relations for the Calculation of Gas Flows with Strong Shock Waves."

report submitted for the Xth International Congress of Applied Mechanics, Stresa, Italy, 31 Aug - 7 Sep 60.

CHERNYY, G. G.

"The Use of Integral Relations for the Calculation of Gas Flows with Strong Shock Waves."

report to be submitted for the Intl. Council of the Aeronautical Sciences, Second International Congress, Zurich, Switzerland, 12-16 Sep 60.

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SOV/40-24-1-16/28

AUTHOR: Chernyy, G. G. (Moscow)

TITLE: Application of Integral Relationships to the Problems on the Propagation of Strong Shock Waves

PERIODICAL: Prikladnaya matematika i mekhanika, 1960, Vol 24, Nr 1, pp 121-125 (USSR)

ABSTRACT: This paper essentially summarizes some of the author's previous articles. In a group of papers (Dokl. AN SSSR, Vol 107, Nr 5, 1956 and Vol 112, Nr 4, 1957; Izv. AN SSSR, OTN, Nr 3, 1957), he gave an approximate method for investigating nonautomodel gas flows in which shocks propagate. This entailed expanding in a special way, the gasdynamical quantities in powers of the parameter ϵ, characterizing the ratio of the density in front of the shock to that behind the shock. This leads to a system of equations from which the successive terms of the series can be obtained by quadrature. By keeping the first two terms of the series, the author expresses the flow quantities behind the shock in the disturbed

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region in terms of the function which describes how the shock propagates as a function of the time. An equation for determining the first term in the expansion of the shock equation is found by insertion of the expressions for the particle speed and pressure in terms of this quantity into the integral form of the law of conservation of energy applied to the entire disturbed region. It is then shown that the flow quantities obtained by way of solving this equation yield for $\epsilon = 1/6$ very satisfactory results when compared to known automodel solutions of the problem of a piston expanding according to the law: ct^{n+1} $(n \neq -1)$. One quantity graphically compared is the ratio of the volume displaced by the piston to the volume bounded by the shock as a function of the variable $2n/\nu(n + 1)$, $\nu = 1, 2, 3$ corresponding to plane, cylindrical, and spherical flows. Also treated is the problem of a strong blast and a comparison of a certain pressure ratio is made. In this case, it

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is shown that the results obtained are satisfactory for the examples discussed down to values of ϵ of the order of .2-.3. The author concludes that the equation obtained can also be used in any nonautomodel motion arising in a blast or piston expansion as long as the intensity of the shock is such that ϵ does not exceed this range. The solution of the mentioned equation can also be used for finding the shape of a shock arising in the flow about a profile or surface of revolution when the front end of the body is slightly blunted. (Fizmatgiz, M., 1959). There are 3 figures; and 10 references, 9 Soviet, 1 U.K. The U.K. reference is: G. J. Taylor, The Air Wave Surrounding an Expanding Sphere. Proc. Roy. Soc., A 186, 100 (1946).

SUBMITTED: November 18, 1959

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26.2114

S/040/61/025/001/011/022
B125/B204

AUTHOR: ~~Chernyy, G. G.~~ (Moscow)

TITLE: The method of integral relations for calculating the flows of a gas with strong shock waves

PERIODICAL: Prikladnaya matematika i mekhanika, v. 25, no. 1, 1961, 101-107

TEXT: The present paper contains a short report concerning the method mentioned in the title and gives new examples of solutions. The author studies gas flows with plane, cylindrical and spherical waves in the propagation of a shock wave in a gas at rest. The gas is enclosed within the shock wave and a surface located within the range of motion. The latter always consists of the same gas particles and is here described as "piston surface". M, K, and E denote the mass, momentum and energy of the gas in the volume considered: X

$M = \int_V \varrho dV$, $K = \int_V \varrho v dV$, $E = \int_V \varrho(\frac{v^2}{2} + e)dV$ (1.1). From the laws of

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conservation then follows $\dot{M} = \varrho^{o}\dot{R}^{o}S^{o}$ or $M = \varrho^{o}V^{o} + \mathrm{const}$ (1.2)

$$\dot{K} = p_{*}S_{*} - p^{o}S^{o} + \int_{S_{*}}^{S^{o}} p\,dS \quad (1.3), \qquad \dot{E} = \varrho^{o}\dot{R}^{o}S^{o}e^{o} + p_{*}\dot{R}_{*}S_{*} \quad (1.4).$$

Here, ϱ denotes the density, v - velocity, p - pressure, e - the internal energy of the mass unit of the gas (for a perfect gas there holds $e = p/(\gamma - 1)\varrho$), γ - the ratio of the specific heats). R and S denote the radius and the surface area, which bound the separated gas volume, V - the volume within the surface S. ^{o} denotes the shock wave and the parameters of the gas in front of it, the asterisk $_{*}$ the second bounding surface and the parameters of the gas behind it. The time dependence of the parameters of the gas may be determined from (1.2), (1.3) and (1.4) and also from any additional conditions, viz. like in the case of the various variants of the method of integral relations in the boundary layer theory. As additional conditions, the differential equations of motion in various approximated forms are suited. There follow some variants for the use of integral relations. The author begins with the

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most simple assumption that pressure and velocity of all gas particles within the range between the shock wave and the piston are equal, which means that they depend only on time. The equations of conservation for momentum and energy then read

$$M\dot{v} + \dot{M}v = (p-p^0)S^0, \quad \frac{d}{dt}\left[\frac{Mv^2}{2} + \frac{p(V^0-V_*)}{\gamma-1}\right] = \dot{M}e^0 + p\dot{V}_* \quad (2.2).$$

For determining the three quantities p, v and V^0 a further relation between them is still required. Fig. 1 shows the comparison of the exact solution of the piston expanding according to the exponential law and of the solution obtained here for $p^0 = 0$ and $\gamma = 1.4$. The dotted lines here show the approximated values of the ratios (pressure on piston/pressure behind the shock wave) and (volume of piston/volume bounded by the shock wave). For these ratios

$$\frac{V_*}{V^0} = \frac{(1+\vartheta)\left(\frac{2\gamma}{\gamma+1} + \frac{\vartheta}{2}\right)}{\left(1+\frac{\vartheta}{2}\right)(\gamma+\vartheta)}, \quad \frac{p_*}{p^0} = 1 + \frac{\vartheta}{2} \quad \left(\vartheta = \frac{2n}{\nu(n+1)}\right).$$

$\nu = 1,2,3$ for flows with

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The method of integral relations...

plane, cylindrical and spherical waves, n - exponent in the expansion law of the piston $R_* \sim t^{n+1}$. The accuracy of the approximated method is, with respect to its simplicity, satisfactory. As additional relations between the quantities entering into the integral relations, those holding for similarity-type motions are well suited. This method is similar to the method of similarity-type solutions in the theory of the boundary layer of a viscous liquid developed by Kochin and Loytsyanskiy. Also the method of the compressed layer can get the form of the method of integral relations, if as approximated pressure and velocity distributions, the principal terms of the corresponding series with respect to ε are taken. The following approximated expressions for velocity and pressure are obtained:

$$v = \frac{2}{\gamma+1}\left(\dot{R}^{\circ} - \frac{a^{\circ 2}}{\dot{R}^{\circ}}\right) + O(\varepsilon) \qquad (4.1)$$

$$p = p^{\circ} + \frac{2}{\gamma+1}\rho^{\circ}(\dot{R}^{\circ 2} - a^{\circ 2}) + \rho^{\circ}\frac{R^{\circ}\ddot{R}^{\circ}}{\nu} - \frac{\ddot{R}^{\circ}}{R^{\circ \nu-1}}m + O(\varepsilon)$$

Here a° denotes the velocity of sound in the gas at rest, m - the

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B125/B204

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Lagrange coordinate. For R^0 one then obtains the equation

$$\frac{d}{dt}\left\{\frac{1}{2}\left[\frac{2}{\gamma+1}\left(\dot{R}-\frac{a^{\circ 2}}{\dot{R}}\right)\right]^2 \rho^\circ R^\nu + \frac{p_*}{\gamma-1}\left(R^\nu - R_*^\nu\right)\right\} = \frac{p^\circ}{\gamma-1}\frac{dR^\nu}{dt} + p_*\frac{dR_*^\nu}{dt}. \quad (4.2),$$

где

$$p_* = p^\circ + \frac{2}{\gamma+1}\rho^\circ\left(\dot{R}^2 - a^{\circ 2}\right) + \frac{\rho R\ddot{R}^\circ}{\nu}$$

The calculations carried out by G. Orlova and R. Burmistrova are pointed out. As examples, a non-steady supersonic source in a compressible gas (in shock tubes with divergent nozzle), as well as tubes consisting of cylindrical and conical parts are investigated. There are 2 figures and 3 Soviet-bloc references.

SUBMITTED: November 18, 1960

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The method of integral relations...

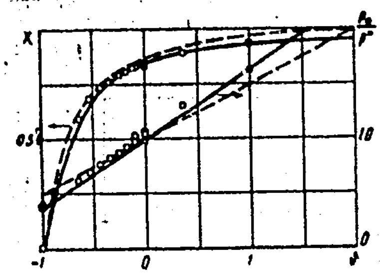

Fig. 1

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CHERNYY, G. G.

"Tip-bluntness Effect in Hypersonic Flow."

report presented at the 4th Intl. Symposium on Space Technology and Science, Tokyo, Japan, 27-31 Aug 1962.

CHERNYY, G. G.,

"On Moments Relations on the Discontinuity Surfaces for Dissipative Media"

report presented at the Sixth Symposium on Advanced Problems in Fluid Mechanics, Zakopane, Poland, 2-6 Sep 63

ACCESSION NR: AP4015966 S/0040/63/027/005/0784/0793

AUTHORS: Barenblatt, G. I. (Moscow); Chernyy, G. G. (Moscow)

TITLE: Moment relations on surfaces of discontinuity in dissipative media

SOURCE: Prikl. matem. i mekhan., v. 27, no. 5, 1963, 784-793

TOPIC TAGS: moment relation, surface of discontinuity, dissipative medium, solid medium, narrow zone, continuous solution

ABSTRACT: In many cases the lack of continuous solutions for equations of motion within the model of a solid medium makes it necessary to introduce surfaces of discontinuity on which the characteristics of the medium and the motion are subject to jump-like changes. In mechanics of solid media surfaces of discontinuity are also used as a convenient approximation with respect to narrow zones where the motion or the medium has properties which are essentially different from the basic field. In either case one must satisfy conditions on the surfaces of discontinuity which make it possible to relate continuous solutions on both sides of the surface. Generally, these conditions mean physically the giving of a definite value of concentrated effects on the surfaces of discontinuity, or, in particular, the

ACCESSION NR: AP4015966

absence of concentrated effects on these surfaces. If the surfaces of discontinuity approximately represent relatively thin regions in which the motion or the medium has properties different from the basic field, then for determining the magnitude of the concentrated effects it is generally necessary to study the interior structure of these thin regions. Usually the dynamic conditions on the surfaces of discontinuity are derived from the laws of conservation of mass, energy, and impulse taken in integral form. For ideal media, the relationships of conservation of mass, energy and impulse in many cases yield a number of conditions on the surfaces of discontinuity necessary for determining the solutions. For dissipative media, single relations of conservation of mass, energy and impulse are insufficient; this occurs for viscous fluids. As additional conditions on the surface of discontinuity in the boundary layer of viscous, heat-conductive fluid, one can use conditions of continuity for the tangential component of velocity and temperature. The authors show that additional relations for a dissipative medium can be obtained as moment relations of rather high orders. In particular one can thus obtain conditions of continuity of velocity and temperature in viscous, heat-conductive fluid. The authors also show that in the boundary layer there is no surface of discontinuity for the longitudinal component of velocity. The lack of discontinuities for the tangential component of velocity is specific for Newtonian

ACCESSION NR: AP4015966

viscous fluid; in other dissipative media such discontinuities may exist. The authors give an example of a dissipative medium in which the discontinuities of velocity, initially present, do not disappear instantaneously but decay exponentially with time. Analogous conditions can also occur for discontinuities of temperature. The obtaining of additional relations on surfaces of discontinuity is especially valuable for various models of media with a complex (including higher derivatives) structural dependence of stresses on deformations, velocities of deformations, etc. The importance of such models has grown with the appearance of a great quantity of new materials. "The authors, with sincere gratitude, mention the valuable advice given by L. I. Sedov in the discussion of these problems and the friendly attention of S. S. Grigoryan and R. L. Salganik to the work." Orig. art. has: 3 figures and 32 formulas.

ASSOCIATION: In-t mekhaniki MGU (Institute of Mechanics, Moscow State University)

SUBMITTED: 03Jun63 DATE ACQ: 21Nov63 ENCL: 00

SUB CODE: PH NO REF SOV: 004 OTHER: 002

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CHERNYY, G.G.

Conference on the Mechanics of Liquids and Gases. Vest. AN SSSR 33 no.12:78 D '63. (MIRA 17:1)

1. Chlen-korrespondent AN SSSR.

CHERNYY, G.G.

Hypersonic flow past a slender bluntnosed body and its analogy with an explosion. Dokl. AN SSSR 151 no.2:302-305 Jl '63.
(MIRA 16:7)

1. Chlen-korrespondent AN SSSR.
(Aerodynamics, Hypersonic)

CHERNYY, G. G.

"Flat wing in hypersonic flow."

report submitted for 11th Intl Cong of Applied Mechanics, Munich, W. Germany, 30 Aug-5 Sep 64.

CHERNYY, G.G. (Moskva)

Study on minimum drag bodies at high supersonic velocities.
Prikl. mat. i mekh. 28 no.2:387-389 Mr-Ap'64. (MIRA 17:5)

ACCESSION NR: AP4022710 S/0020/64/155/002/0302/0305

AUTHOR: Cherny*y, G. G. (Corr. member, AN SSSR)

TITLE: Supersonic flow around wings at large angles of incidence

SOURCE: AN SSSR. Doklady*, v. 155, no. 2, 1964, 302-305

TOPIC TAGS: supersonic flow, aerodynamics, wing flow, incidence angle, shock wave, flat wing, delta wing

ABSTRACT: In supersonic flow at large incidence angles, the layer of the compressed gas between the shock wave and the leading edge of the wing surface is relatively thin. For the description of the gas motion in this layer, the method of integral relationship in its simplest form can be used by assuming that in the compressed layer, the velocity components tangential to the wing element, the pressure, and the density are constant along the wing normal, and that the normal component can be disregarded. Flat wings are considered. In addition to the equations for conservation of mass,

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ACCESSION NR: AP4022710

momentum, and energy, a relationship between the pressure and density is assumed. The system of equations is solved for the cases of normal flow around a round wing, the flow around a flat infinite span wing without sideslip, and the flow around a delta wing. Orig. art. has: 4 figures and 6 formulas.

ASSOCIATION: Nauchno-issledovatel'skiy institut mekhaniki moskovskogo gosudarstvennogo universiteta im. M.L. Lomonosova (Research Institute of Mechanics, Moscow State University)

SUBMITTED: 16Dec63 ATD PRESS: 3050 ENCL: 00

SUB CODE: ME NO REF SOV: 003 OTHER: 001

Card 2/2

CHERNYI, G.G. (Moskva)

Wings in a hypersonic flow. Prikl. mat. i mekh. 29 no.4:616-634 Jl-Ag '65.
(MIRA 18:9)

L 41593-65 EWT(d)/EWT(1)/EWP(m)/EWT(m)/EWP(w)/EWG(v)/T-2/EWP(k)/FCS(k)/
EWA(h)/EWA(c) Pd-1/Pe-5/Pf-4/Peb WW/EM

ACCESSION NR: AP5010823 UR/0020/65/161/004/0791/0794

AUTHOR: Chernyy, G. G. (Corresponding Member AN SSSR) 45 44 B

TITLE: Two-dimensional wing in hypersonic flow

SOURCE: AN SSSR. Doklady, v. 161, no. 4, 1965, 791-794

TOPIC TAGS: hypersonic flow, two dimensional wing, three dimensional flow, conical flow, characteristic method

ABSTRACT: Hypersonic three-dimensional flow of an ideal gas past a two-dimensional wing at an angle of attack is investigated. The problem of flow on the windward side of a two-dimensional wing at large angles of attack and large Mach numbers is reduced here to determining two-dimensional flow over a wing by means of a system of equations corresponding to boundary conditions on the wing contour. This system is solved by the method of characteristics. The lines which settle the boundaries of the regions of different modes of symmetrical flows past a delta wing are plotted for the case of $M = \infty$ and $\gamma = 1.4$; the possibility of conical flows in these different regions is discussed. A series of flow configurations past a wing with a semi-apex angle of 10° at angles of attack varying from 0 to 180° are given and analyzed. The method used here for deriving the system of equations describing the flow sub-

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ACCESSION NR: AP5010823

stantiates and revises the author's approximate approach to the solution of hyper-sonic flow past a wing (Doklady AN SSSR, v. 155, no. 2, 1964). Orig. art. has: 1 figure and 5 formulas. [AB]

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University)

SUBMITTED: 31Dec64 ENCL: 00 SUB CODE: ME

NO REF SOV: 001 OTHER: 000 ATD PRESS: 3233

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L 20994-66 EWT( )/FS(m)/EWT(1)/EWP(m)/EWT(m)/EWP(w)/EWA(d)/T-2/E ?(k)/EWA(h)/
ACCESSION NR: AP5021297 ETC(m)-6/EWA(1) EM UR/0040/65/029/004/0616/0634

AUTHOR: Chernyy, G. G. (Moscow)

60
B

TITLE: Wings in hypersonic flow

SOURCE: Prikladnaya matematika i mekhanika, v. 29, no. 4, 1965, 616-634

TOPIC TAGS: hypersonic flow, delta wing, integral relations method, aerodynamics, flow analysis, supersonic shock wave, conic flow, angle of attack

ABSTRACT: The advantages and peculiarities of the method of integral relations as applied to solving many problems of the mechanics of continuum are stressed, and the methods devised by B. G. Galerkin, L. V. Kantorovich, and Karman are briefly discussed. The development of computer techniques makes it possible to effectively obtain approximations of sufficiently high order thus reducing the requirements for the prior choice of a given part of the solution and the form of the initial equations. The application of this method to the problem of a three-dimensional, supersonic flow of an ideal gas over a thin wing is considered and a detailed qualitative analysis of a system of differential equations of the zeroth approximation is carried out. These equations are interpreted as the equations of two-dimensional gas flow over a surface. Flows over wings with various forms of leading edge are considered and the

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ACCESSION NR: AP5021297

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possibility of applying the linearized equations to calculating flow parameters is investigated. Conic flows such as certain flows over delta, trapezoidal, and other wings are studied as an example of the use of nonlinear equations. Two specific flow patterns over wings are analyzed in detail and discussed for various values of M, angle of attack α, and apex angle of the leading edge. A short derivation of the fundamental system of equations and an analysis of certain of their properties were given in two previous works by the author (in Doklady Akademiya nauk, SSSR, v. 155, no. 2, 1964; v. 161, no. 4, 1965). Orig. art. has: 13 figures and 22 formulas. [AB]

ASSOCIATION: none

SUBMITTED: 13Apr65 ENCL: 00 SUB CODE: ME

NO REF SOV: 008 OTHER: 000 ATD PRESS: 4075

Card 2/2 BK

ACC NR: AP6034532

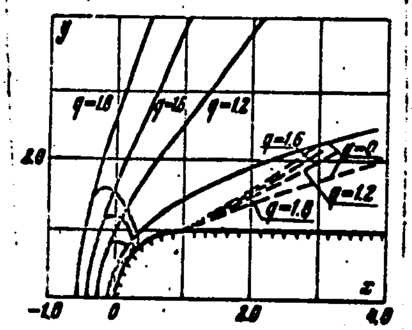

Fig. 1. Flow pattern around a sphere or semisphere attached to a cylinder

In the latter case, the analysis did not present any difficulties. In the former case, which resembles the problem of a supersonic jet of finite width impinging on an obstacle, mathematical difficulties were experienced. The analysis was based on the assumption that an axisymmetric body placed in a supersonic stream generates a shock wave which ignites the mixture. The heat release at all points of the detonation wave is equal. First the subsonic and transonic and then the supersonic regions were calculated by methods developed for adiabatic flows. The following equation was obtained for the velocity component normal to the detonation wave:

$$V_n = \frac{\Lambda_1}{\sin\beta}\left\{\frac{\gamma_2 \sin^2\beta}{\gamma_2+1} + \frac{1}{\gamma_2+1}\left(\frac{\gamma_2}{\gamma_1 M_1^2} - \left[\left(\sin^2\beta - \frac{\gamma_2}{\gamma_1 M_1^2}\right)^2 - B\sin^2\beta\right]^{1/2}\right)\right\}$$

$$B = 2(\gamma_2^2 - 1)\left[\frac{q}{2\Lambda_1^2} - \left(\frac{\gamma_2}{\gamma_2-1} - \frac{\gamma_1}{\gamma_1-1}\right)\frac{1}{\gamma_1 M_1^2}\right], \quad \Lambda_1 = \left(\frac{(\gamma_1-1)M_1^2}{2+(\gamma_1-1)M_1^2}\right)^{1/2} \quad (4)$$

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ACC NR: AP6034532

where subscripts 1 and 2 denote regions before and after the detonation wave, and q is a parameter characterizing the heat release in the detonation wave. Fig. 1 shows the flow past a sphere or a semisphere attached to a cylinder. The broken lines represent the characteristics from the point where the semisphere is attached to the cylinder. The figure shows that with increasing q the detonation wave is displaced from the solid surface which is a similar to the effect obtained by decreasing the Mach number of an incident adiabatic flow. However, at a short distance the detonation wave assumes a flat shape corresponding to a Chapman-Jouguet detonation. It is concluded that the problem has a unique solution which depends on the selection of the point where the detonation wave disintegrates. For a zero thickness detonation wave this point cannot be determined. At a sufficiently high heat release the detonation wave approaches the Chapman-Jouguet condition. Therefore, in cases when the detonation wave disintegration the point of disanintegration will be located at a small distance from the solid surface. Orig. art. has: 8 figures and 7 formulas.

SUB CODE: 21/ SUBM DATE: 26May66/ ORIG REF: 003/ OTH REF: 005/ ATD PRESS: 5106

SOV/20-125-4-39/74

5(3,4)

AUTHORS: Topchiyev, A. V., Academician, Alaniya, V. P., Chernyy, G. I.

TITLE: On the Problem of the Interaction of Olefins With Ammonia in the Presence of Oxide Catalysts (K voprosu o vzaimodeystvii olefinov i ammiaka v prisutsvii okisnykh katalizatorov)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 125, Nr 4, pp 829-830 (USSR)

ABSTRACT: The synthesis of olefin- and partly also of methane hydrocarbons in the course of which nitriles results is a new procedure. It is based upon the reaction of the unsaturated hydrocarbons with ammonia, proceeding at 470-500° in the presence of oxide catalysts: $RCH = CH_2 + NH_3 \longrightarrow CH_3CN + RH + H_2$.

A survey on publications is given (Refs 1-3). In the work under review the authors investigated the interaction between isobutylene and ammonia (molar ratio from 1 : 2 to 1 : 5) by means of the German industrial catalyst Nr 1360, in which connection to begin with HCl was introduced into the reaction zone. The reaction proceeded in the vapor phase at 290-500°. The liquid products obtained were distilled in 3 fractions: 1) 44-90°, 2) 90-98° and 3) above 98°. In the case of ex-

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SOV/20-125-4-39/74

On the Problem of the Interaction of Olefins With Ammonia in the Presence of Oxide Catalysts

periments carried out without HCl the results did fully agree with the publication data. The formation of nitriles begins at above 400° and arrives at its maximum at 480-485°. Above 500° the formation of acetonitriles decreases. The best ratio between ammonia and hydrocarbon is 5 : 1. Table 1 shows several interesting experiments carried out in the presence of HCl. HCl increases the yield in acetonitrile. Apart from the latter also propionitrile and higher nitriles form. There is 1 table.

SUBMITTED: December 19, 1958

Card 2/2

AUTHOR: Chernyy, G.I. SOV-21-58-9-10/28

TITLE: The Effect of the Working Depth on Slide Angles of Rocks in Steep Ore Deposits of the Krivoy Rog Basin (Vliyaniye glubiny razrabotki na ugly sdvizheniya porod krutopadayushchikh rudnykh zalezhey Krivorozhskogo basseyna)

PERIODICAL: Dopovidi Akademii nauk Ukrains'koi RSR, 1958, Nr 9, pp 955 - 958 (USSR)

ABSTRACT: Using iron ore mines in the Krivoy Rog basin and in the Urals as examples, the author considers the effect of the working depth on the slide angle of rocks in thick steep ore deposits. He shows that an increase in working depth leads to the flattening out of the slide angle in the hanging layers, up to a certain limit, and to the dislocations of the underlying layers. The latter phenomenon presents the greatest danger for the mine shafts and buildings which are usually located on the rocks of the foot layers. The author derives a formula for determining the conditions of stability of the underlying layers, as a function of the working depth, strength

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SOV-21-58-9-10/28

The Effect of the Working Depth on Slide Angles of Rocks in Steep Ore Deposits of the Krivoy Rog Basin

characteristics of the rocks and other factors. Calculations are performed on this formula for the conditions of the Mine imeni Komintern. There are 1 table, 1 diagram and 3 Soviet references.

ASSOCIATION: Institut gornogo dela AN UkrSSR (Institute of Mining of the AS, UkrSSR)

PRESENTED: By Member of the AS UkrSSR, N.A. Starikov

SUBMITTED: March 20, 1958

NOTE: Russian title and Russian names of individuals and institutions appearing in this article have been used in the transliteration.

1. Underground structures--Stability 2. Geology--USSR
3. Mining engineering--USSR

Card 2/2

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[Faults in the lying wall of the Krivoy Rog Basin] Zrushennia porid lezhachoho boku v Kryvoriz'komu baseini. Kyiv, Vyd-vo Akad.nauk URSR, 1959. 67 p. (MIRA 12:9)

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(Mining engineering) (Faults (Geology))

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Ugol' Ukr. 3 no.11:23-24 N '59. (MIRA 13:3)
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(Great Britain—Mine timbering)

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(Belozerka (Zaporozh'ye Province)—Iron mines and mining)

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Conducting stoping operations under mine buildings in the Lvov-Volyn Basin. Ugol' Ukr. 7 no.11:20-22 N '63. (MIRA 17:4)

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Underworking strip mine tracks by underground mining in the Krivoy Rog Basin. Nauch. zap. Ukrniiproekta no.10:37-42 '63. (MIRA 17:6)

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